DOCUMENT RESUME

ED 393 445 IR 017 783

TITLE	Technology Education Instructional Materials: Elementary-High School. February 1996.
INSTITUTION	National Science Foundation, Arlington, VA. Directorate for Education and Human Resources.
REPORT NO	NSF-95-64
PUB DATE	Feb 96
NOTE	27p.; Replaced NSF-94-4.
AVAILABLE FROM	NSF Forms and Publications Unit, Room P-15, 4201 Wilson Boulevard, Arlington, VA 22230; E-mail: pubs@nsf.gov
PUB TYPE	Reference Materials - Directories/Catalogs (132)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Class Activities; Course Content; *Curriculum; Elementary Secondary Education; Information Sources; *Instructional Materials; Integrated Activities; Learning Modules; *Mathematics Education; *Science Education; *Technological Literacy

ABSTRACT

This document is a directory of K-12 instructional materials that integrate math and science with technology education, or programs designed to teach understanding and competence in technology. The directory is divided into elementary, middle school, and high school materials. Listings refer to learning modules, course outlines, or entire curricula. Each entry typically provides: (1) title of the instructional package; (2) name, address, and phone number of the developer; (3) name, address, and phone number of the distributor; (4) date available, sometimes current but often projected; and (5) a brief description of the components and goals of the package. (BEW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IR

ED 393 445

Instructional Materials Development Program

TECHNOLOGY EDUCATION INSTRUCTIONAL MATERIALS

Elementary - High School

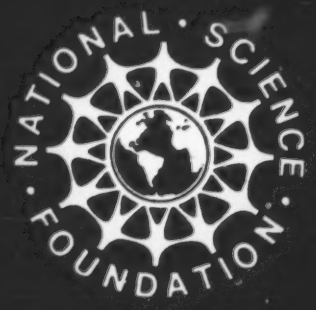
February 1996

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.



Division of Elementary, Secondary and Informal Science Education
Directorate for Education and Human Resources

NATIONAL SCIENCE FOUNDATION

IR017783

BEST COPY AVAILABLE

The Foundation provides awards for research in sciences and engineering. The awardee is wholly responsible for the conduct of such research and preparation of the results for publication. The Foundation, therefore does not assume responsibility for the research findings or their interpretations.

The Foundation welcomes proposals on behalf of all qualified scientists and engineers and strongly encourages women, minorities and persons with disabilities to compete fully in any of the educational, research and research-related programs described in this document. In accordance with Federal statutes and regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participating in, denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including students) to work on an NSF project. See the program announcement, or contact the program coordinator in the Directorate for Education and Human Resources.

Catalog of Federal Domestic Assistance Number: 47.076 Education and Human Resources

CONTENTS

INTRODUCTION i

ELEMENTARY

Science for Life and Living: Integrating Science, Technology and Health 1
Technology Education Consortium Project 1
Project UPDATE (Upgrading Practice through Design and Technology/Engineering Education) 2
Insights 2
Science and Technology for Children 3

MIDDLE SCHOOL

Science & Technology: Investigating Human Dimensions 4
Doable Engineering Science Investigations Geared for Non Science Students (DESIGNS) 4
Integrated Mathematics, Science, and Technology (IMAST I & II) 5
Middle School Mathematics Through Applications Project (I & II) 6
A World in Motion II: The Design Experience, Challenge II 7
Professional LINKS Project 7
Chemical Education for Public Understanding Project 8
PRIME Science 8
Integrating Middle School Technology Education Activities With Science and Math Education 9

HIGH SCHOOL

ACTIVE PHYSICS 10
Engineered Environment Laboratory Curriculum 10
Applications/Reform in Secondary Education (ARISE) 11
Development of an Effective Decision-Skills Curriculum for Secondary School Students 11
Priming the Pump: Connected Geometry 12

HIGH SCHOOL, continued

High School Mathematics Courseware: Utilizing Real-World Problem-Solving to Teach Mathematics 12

West Hawaii Explorations Academy: A Center for Integrative Secondary Curriculum Development 13

Manufacturing Technology Learning Modules: Integrating Mathematics and Technology Education Curriculum 14

Materials World Modules 14

Technology for Science (I & II) 15

Professional LINKS Project 16

Agriculture-Based Secondary Mathematics Project 16

INTRODUCTION

This guide describes instructional materials that integrate technology education with mathematics and/or science. Technology education refers to K-12 school programs designed to teach understanding and competence in technology and in assessing the appropriateness of technological actions. Technology is the field of study that applies knowledge, resources, materials, tools and information to the design, production and use of products, structures and systems. Technology extends the capability of humans to modify and control their environment.

One of the major goals of the National Science Foundation (NSF) is to contribute to the preparation of a well-educated, technologically literate workforce that can meet the challenges of the 21st century and beyond. One strategy adopted by the NSF to meet this goal is to support science, mathematics, engineering and technology education programs. Support of educational programs in these areas not only increases the general scientific and technological literacy of the citizenry, but it also contributes to the preparation of technologically literate citizens and youth able to consider a wide range of careers in the high performance workplace as scientists, mathematicians, engineers, engineering technologists, and technicians.

The Division of Elementary, Secondary and Informal Education (ESIE) in the Directorate for Education and Human Resources supports the development of technology education materials through its Instructional Materials Development (IMD) program. The program supports projects that integrate technology education, science, and mathematics at the elementary, middle and secondary levels. The IMD program staff have prepared this guide for educators across the nation to use as a resource for technology education instructional materials. Many of the projects in the publication have been completed and are available for classroom use, others are near completion, and some have just recently started. The program staff of IMD hope that this publication is used to explore the variety of options and resources available for teaching technology education to students in grades K-12.

For further information please contact:

Program Officers
Instructional Materials Development Program
National Science Foundation
Room 885
4201 Wilson Boulevard
Arlington, VA 22230
703/306-1620

John Bradley
Alverna Champion
Rodney Custer
Janice Earle
James Ellis
M. Patricia Morse
Gerhard Salinger

ELEMENTARY SCHOOL

Science for Life and Living: Integrating Science, Technology and Health

Developer:
Catherine Monson
Biological Sciences Curriculum Study (BSCS)
830 North Tejon, Suite 405
Colorado Springs, CO 80903
(719) 578-1136

Publisher/Distributor:
Kendall/Hunt Publishing Co
4050 Westmark Dr
P O Box 1840
Dubuque IA 52004
(800) 228-0810

Date Available: in print

This program is designed to educate children (grades K-6) about science, technology and health. At each grade level, one major concept and one major skill are used to integrate the three areas. Students learn science and technology content and process skills as well as social skills, problem solving, and decision making.

The program features the following units:

Grade K	--	Awareness of Movement
	--	Awareness of Technology
Grade 1	--	Order and Organization
Grade 2	--	Change and Measurement
Grade 3	--	Patterns and Prediction
Grade 4	--	Systems and Analysis
Grade 5	--	Energy and Investigation
Grade 6	--	Balance and Decisions

The program includes teachers' guides, student text, and hands-on materials kits for each grade level as well as an implementation guide for school district administrators. Supplementary activities are available that integrate reading, language arts, and mathematics.

Technology Education Consortium Project

Developer:
Lou Colby
Walter Buster
Cotati-Rohnert Park School District
111 McInnis Parkway
San Rapael, CA 94903
(415) 507-5668

Publisher/Distributor:
None

Date Available: 1997 est

The Cotati-Rohnert Park Unified School District (CRPUSD), in partnership with the Autodesk Foundation, Hewlett Packard Corporation, Sonoma State University and Santa Rosa Junior College, is implementing project-based learning in elementary schools. Most of the student learning is to be done in project-based activities. The design brief is used to engage students in applying their learning to real world situations of interest to them. Portfolios are used to assess student learning, evaluate teacher professional development and to document the progress in the project. Teacher professional development includes adapting existing materials to the design brief format; implementing thematic projects, based on design, in the classroom; assessing student progress; and assisting other teachers in implementing project-based learning.

Project UPDATE (Upgrading Practice through Design and Technology/Engineering Education)

Developer:
Ronald Todd
Trenton State College
School of Technology
103 Armstrong Hall
Trenton, NJ 08650
(609) 771-3333

Publisher/Distributor:
TIES Magazine
Trenton State College
103 Armstrong Hall
Trenton NJ 08650
(609) 771-3333

Date Available: 1996 est

This project develops twelve K–8 curriculum packages for teaching integrative mathematics, science, and technology. The materials focus on design, technology, and problem-solving approaches. They can also be used as models for innovative instruction and further curriculum development efforts of teachers and professionals from science, mathematics, engineering, design, and technology. A teacher-enhancement program is initiated regionally through participating teacher-training institutions.

National dissemination of the models and materials is accomplished primarily through *TIES Magazine*—a free periodical published by Trenton State College for teachers. The curriculum materials support a national commitment to improve education in mathematics, science, and technology by reconstructing what professionals have learned as they continue to put their knowledge to work.

INSIGHTS

Developer:
Karen Worth
Judith Sandler
Education Development Center (EDC), Inc.
55 Chapel Street
Newton, MA 02101
(617) 969-7100

Publisher/Distributor:
Education Development Center (EDC), Inc
55 Chapel Street
Newton, MA 02101
(617) 969-7100

Date Available: in print

INSIGHTS is a hands-on, inquiry-based science curriculum for grades K-6. INSIGHTS curriculum materials are designed to develop children's understanding of scientific concepts, to improve creative and critical thinking skills, to encourage problem solving through experiences in the natural environment, and to develop positive attitudes about science. The curriculum consists of 17 modules that integrate topics from the life, earth and physical sciences.

The program features the following unit areas for grades K-6:

K/1	Myself and Others; Balls and Ramps; Living Things;
2/3	Growing Things; Habitats; Sound; Liquids; Lifting Heavy Things;
4/5	Bones and Skeletons; Reading the Environment; Circuits and Pathways; The Mysterious Powder; Changes of State;
6	Human Body Systems; There is No Away; and Structures

INSIGHTS modules are 6-8 weeks long, and include a comprehensive Teacher's Guide and a set of materials.

Science and Technology for Children

Developer:
Douglas Lapp
National Science Resources Center
Smithsonian Institution and National
Academy of Sciences
Arts and Industries Building, Room 1201
Washington, DC 20560
(202) 367-4892

Publisher/Distributor:
Carolina Biological Supply Company
2700 York Road
Burlington NC 27215
1(800) 227-1150

Date Available: in print

The Science and Technology for Children (STC) program consists of twenty-four 8-week curriculum units (four at each grade level, 1–6) that actively involve children in hands-on, inquiry-centered investigations of scientific phenomena. Using discovery, reflection, and applications, the STC units provide children with the opportunity to learn developmentally appropriate concepts central to the life, earth, and physical sciences, and technology. Simultaneously, children develop critical thinking and problem-solving skills.

STC units provide teachers with a variety of strategies with which to assess student learning as well as opportunities to link the teaching of science with other areas of elementary school curriculum, including mathematics, language arts and social studies. In addition, the STC units encourage the use of cooperative learning to help students to work effectively as a team.

The following units are available:

- Balancing and Weighing
- Ecosystems
- Floating and Sinking
- Food Chemistry
- Magnifiers and Microscopes
- Measuring Time
- Organisms
- Soils
- Rocks and Minerals

Each unit includes a Student Activity Book, a Teacher Guide and, in some cases, a Student Notebook.

MIDDLE SCHOOL

Science & Technology: Investigating Human Dimensions

Developer:
Rodger Bybee
Janet Carlson Powell
Biological Sciences Curriculum Study
(BSCS)
830 North Tejon, Suite 405
Colorado Springs, CO 80903
(719) 578-1136

Publisher/Distributor:
Kendall/Hunt Publishing Co
4050 Westmark Dr
P O Box 1840
Dubuque IA 52004
(800) 228-0810

Date Available: in print

This three year, activity-based program is available for students in grades 5-9. The program continues the BSCS's K-6 materials and focuses on the specific developmental needs of the early adolescent. It also encourages the participation of female, minority and disabled students; emphasizes reasoning and critical thinking; illustrates careers; and the theme of science, technology and society.

Students explore science and technology ideas by doing investigations and reading about how science and technology relates to their lives. Student Books and Teachers' Guides accompany the following units:

- Unit I/ level A -- Patterns of Change
- Unit II/ Level B -- Limits and Diversity
- Unit III/ Level C -- Equilibrium

Doable Engineering Science Investigations Geared for Non-Science Students (DESIGNS)

Developer:
Philip Sadler
Harvard University
Science Education Department, MS 71
60 Garden Street
Cambridge, MA 02138
(617) 496-4709

Publisher/Distributor:
Please Contact Developer

Date Available: 1997 est

This project develops six modules based on engineering projects for middle school students. These materials aim at inclusion in introductory physical science courses, but may also be used for general science and after-school or other informal teaching situations. The modules cover topics that include: mechanics, electricity, and chemistry.

A team of experienced middle school physical science and technology education teachers, research engineers, and scientists produce effective, up-to-date, activity-based, middle school physical science materials dealing with "designing to constraints." The materials are evaluated to determine their effect on students' involvement and interest in pursuing technical careers as well as changes in their conceptual understanding and science process skills. A particular focus of the evaluation is the impact of the project strategies on urban underrepresented minorities and girls, many of whom have little experience with, or show fear of, mechanical devices.

Integrated Mathematics, Science, and Technology (IMAST I)

Developer:
Franzie Loepp
Robert Fisher
Illinois State University, The Center for Mathematics, Science, and Technology
Julian Hall 210W
Normal, IL 61761
(309) 438-3089

Publisher/Distributor:
Glencoe/McGraw-Hill/MacMillan
936 Eastwind Dr.
Westerville OH 43081
(800) 848-1567

Date Available: 1996 est.

The Center for Mathematics, Science, and Technology (CeMast) develops integrated materials for 7th-grade students centered around the topics of biotechnology, manufacturing, and forecasting. The program requires 120 minutes per day for the year, but students may be in separate classes. Each unit includes objectives, experiential learning, appropriate use of multimedia, appropriate technology, and evaluation instruments. Attention is given to preparing materials that motivate all students—especially those from groups underrepresented in technological careers—to learn basic mathematics, science, and technology concepts by involving them in enriched learning experiences relevant to their daily lives.

The materials are developed with teachers, piloted, revised and tested. Implementation materials are developed so that systemic changes can be made and the materials taught with minimal teacher development. Student performance data are examined to determine increases in achievement in mathematics, science and technology.

Integrated Mathematics, Science, and Technology (IMAST II)

Developer:
Franzie Loepp
Robert Fisher
Illinois State University, The Center for Mathematics, Science, and Technology
Julian Hall 210W
Normal, IL 61761
(309) 438-3089

Publisher/Distributor:
Glencoe/McGraw-Hill/MacMillan
936 Eastwind Dr.
Westerville OH 43081
(800) 848-1567

Date Available: 1999 est.

IMAST II is a year long 8th-grade course that reflects the strong interactions between mathematics, science and technology. Like the 7th-grade model on which it is built, it requires 120 minutes per day for the year, but students may be in separate classes. The coordinated content focuses on environmental science including biological, physical and earth science; algebra and geometry; and communication, construction and transportation technologies. The instruction is constructivist, activity-based, and uses the learning cycle. It emphasizes problem-solving, using real world situations and applications and exhibits the connections among disciplines and between local and global concerns. The materials are developed through the collaboration of master teachers, curriculum specialists and consultants from industry and education. The modules include student and teacher editions, an implementation guide for administrators, and results of ethnographic studies and evaluation data for the program.

Middle School Mathematics Through Applications Project I

Developer:
Shelley Goldman
Institute for Research on Learning (IRL)
66 Willow Street
Menlo Park, CA 94025
(415) 615-7900

Publisher/Distributor:
Please Contact Developer

Date Available: 1996 est

The goal of this project (Middle School Mathematics through Applications Project I) is to increase the mathematics achievement levels of children by creating a new model of mathematics teaching and learning that will bring an "applications approach" to work in middle school mathematics classrooms. The objective of the project is to contribute to current large-scale efforts in reforming mathematics education by examining how mathematics is connected to solving real-life design problems, how certain kinds of classroom activities help students build stronger foundations for thinking and acting mathematically, and how these kinds of shaping activities can open access for more female, minority, and economically disadvantaged students to enter and successfully complete the high school mathematics sequence through calculus.

This project has three main components: (1) new materials and activity structures for learning mathematics in which students use simulations adapted from real work; (2) new teaching and assessment practices that use these materials, emphasizing teachers interacting with students in collaborative working groups and helping students to identify, analyze, and reflect upon the mathematical concepts and skills, thus grounding their problems and their solutions; and (3) new ways for teachers, professionals, and educational researchers to work together. The project is a collaboration between 20 Bay-area mathematics teachers, IRL, Stanford University, and professionals in the area.

Middle School Mathematics Through Applications Project II

Developer:
Shelley Goldman
James Greeno
Raymond McDermott
Institute for Research on Learning (IRL)
66 Willow Street
Menlo Park, CA 94025
(415) 615-7900

Publisher/Distributor:
Please Contact Developer

Date Available: 1997 est

This project, Middle School Mathematics through Applications Project II (MMAP II), builds on and is a continuation of the original MMAP. This project will result in a comprehensive, three-year mathematics program for grades 6-8. The goals of MMAP II include: (1) developing materials to create a complete mathematics program that serves all 6th through 8th graders regardless of prior skills or ability levels; (2) providing resources, materials, and guidance to mathematics educators to help them assemble MMAP materials into a coherent, customized, and affordable curriculum to meet local needs; (3) creating and compiling guidelines and activities to help teachers identify and systematically evaluate mathematical competencies and mathematics embedded in students' work; and (4) galvanizing a community of mathematics educators, researchers, and mathematics-using professionals to collaborate in identifying the needs and means necessary for developing additional MMAP materials. These goals are achieved by using an interactive, cyclical research and development process created and piloted in the previous project. This project creates innovative software and investigations to simulate real world problems that rely on mathematical concepts and skills to solve.

World in Motion II: The Design Experience, Challenge II

Developer:
John Boynton
Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15086
(412) 776-4841

Publisher/Distributor:
Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale PA 15086
(412) 776-4841

Date Available: Feb/March 1996

The engineering design experience —designing, constructing, testing and evaluating, and communicating—is incorporated in three 6–8-week units for middle school students. Each unit is based on a "technological challenge" that requires students to work as a design team to build and present their solutions to the challenge.

The design challenges include development of a toy, a vehicle, and an amusement park ride at 6th, 7th, and 8th grades, respectively. The materials engage students in authentic engineering challenges that become the context for learning mathematics, science, technology education, social sciences, language arts concepts, and skills appropriate to middle school students. The students, teachers, and community members form learning teams in which students assume various engineering and marketing roles.

The products include print materials, hands-on kits, and videos and videodisk reference materials, complemented by software tools.

Professional LINKS Project

Developer:
Keith Finkral
Ronald Todd
Trenton State College, School of Technology
103 Armstrong Hall
Trenton, NJ 08650
(609) 771-3333

Publisher/Distributor:
TIES Magazine
Trenton State College
103 Armstrong Hall
Trenton NJ 08650
(609) 771-3333

Date Available: 1998 est.

Instructional materials that integrate mathematics, science, and technology education are greatly needed. This project produces several instructional packages for secondary school students; the packages are consistent with the standards from each of the disciplines. They are developed in a collaborative effort among teachers, subject specialists, and practitioners from science and industry.

Local and national support is available to help teachers and groups of teachers use the materials. The products include the units, teacher guides for use of the materials, and support via electronic means. Themes to be engaged include science and technology of sports, biotechnology, music, and fire-prevention and control systems.

Chemical Education for Public Understanding Project

Developer:
Herbert Thier
University of California, Berkeley
Lawrence Hall of Science
SEPUP/ CHEM
Berkeley, CA 94720
(510) 642-8718

Publisher/Distributor:
LAB AIDS, Inc.
Sargent Welch
1(800) 727-4368

Date Available: in print

The Chemical Education for Public Understanding Project (CEPUP) develops interdisciplinary materials for use at the middle/junior high school level to introduce students to chemicals and their importance in their lives. CEPUP materials highlight areas of direct societal concern associated with science and technology. Students are given chemistry based activities and experiments that focus on the environment, biotechnologies, industrial processes, agricultural practices, alternative energy sources and health science. The activities utilize inquiry-based problem solving approaches to learning with emphasizes on decision making.

The following units are available:

- Toxic Waste: A Teaching Simulation
- Risk Comparison
- Plastics in Our Lives
- Investigating Groundwater: The Fruitvale Story
- Investigating Chemical Processes: Your Island Factory
- Determining Threshold Limits
- Chemical Survey & Solutions and Pollution

The teacher's manual and student activities are included in one book accompanied by student sheets. The units are distributed by Lab-Aids in the form of modular kits containing equipment and supplies produced by Lab-Aids.

PRIME Science

Developer:
Richard Saykally
Penny Moore
University of California, Berkeley
College of Chemistry
Berkeley, CA 94720
(510) 643-9475

Publisher/Distributor:
Kendall/Hunt Publishing Co.
4050 Westmark Dr.
P.O. Box 1840
Dubuque IA 52004
(800) 228-0810

Date Available: 1997 est.

PRIME Science provides an American adaptation of Salter's Science Program—a well-tested British multidisciplinary science program for middle grades. The science is balanced—not integrated—between life, earth, and physical sciences, developing conceptual understanding and integrating mathematics, technology, and decision making. The science is rigorous, interesting, and useful to the student. Among the major integrative themes that provide structure for grades 6 through 10 are the earth in space and properties of matter. Each unit begins with an application. The teachers' guides are directed at first-year teachers who are not teaching in their major disciplines. The guides cover the following areas: student preconceptions, safety, background, ways of introducing the content, and assessment items. The visually stimulating, attractively designed student supplements for each of the 40 units contain the application, a summary of what students should know, what they need to learn, and the activities they can do. The materials are tested and rewritten by teachers and science educators at several sites throughout the United States. Professors at the University of California, Berkeley, review the materials for content accuracy. The British developers are also part of the design team.

Integrating Middle School Technology Education Activities with Science and Mathematics Education

Developer:
Mark Sanders
James LaPorte
Virginia Polytechnic Institute and State University
144 Smyth Hall
Blacksburg, VA 24061
(703) 231-8173

Publisher/Distributor:
Glencoe/McGraw-Hill
ISBN 0-02-636947-8
936 Eastwind Dr
Westerville OH 43081
(800) 848-1567

Date Available: in print

Seventeen activities that encourage middle school students to learn the concepts of science and mathematics by motivating them with real-world situations of interest to them are developed. The activities use design-under-constraint and hands-on technology (in contrast to hands-on science) to motivate the learning of science and mathematics. The goals are: to increase the ability of students to apply concepts of science and mathematics to real-world situations; to strengthen communications among science, mathematics, and technology teachers; and to explore the role and effectiveness of technology-based activities. Teams of teachers produced materials under the guidance of the principal investigators and science and mathematics educators.

HIGH SCHOOL

Active Physics

Developer:
Bernard Khoury
American Association of Physics Teachers
1 Physics Ellipse
College Park, MD 20740
(301) 209-3300

Publisher/Distributor:
The Learning Team, Inc.
10 Long Pond Road
Armonk, NY 10504-0217
(914) 273-2226

Date Available: 1996 est.

The American Association of Physics Teachers and the American Institute of Physics are developing an innovative, year-long physics course suitable for students in grades 9–12. The course consists of six thematic units -- recreation, transportation, communications and information, health and medicine, home and forecasting—that revisit a few important fundamental physics concepts in a spiral approach, applying them to new, real-world contexts.

The course is consistent with the American Association for the Advancement of Science's Project 2061 themes, particularly materials and energy, and can be taught in 1 year or spread through 4 years. The mathematical level of students will be enhanced in accordance with the National Council of Teachers of Mathematics Standards. A constructivist approach and the use of cooperative grouping strategies are incorporated in the curriculum design. Students will be able to recognize and begin to understand broad unifying concepts of physics and technology, to gain an appreciation of science as a process, to apply the concepts to realistic problem-solving and decision making activities, and to identify and evaluate personal and societal impacts of technology. The materials are developed by teams of scientists and high school teachers with support from cognitive scientists, curriculum experts, and technology educators. Teachers are provided with the knowledge, skills, and support to make effective use of the materials.

Engineered Environment Laboratory Curriculum

Developer:
Iris Metts
Paul Devine
Catherine Houhgton
Christina School District
83 East Main Street
Newark, DE 19711
(302) 454-2000

Publisher/Distributor:
TIES Magazine
Trenton State College
103 Armstrong Hall
Trenton NJ 08650
(609) 771-3333

Date Available: 1997 est.

This project develops, an interdisciplinary curricula and materials based on an Engineered Environment Laboratory. The materials provide instruction and guidance to students for recreating a local habitat. The habitat, which is to be developed in Delaware, interfaces a temperate hardwood forest with an old-field agricultural system and a freshwater marsh. This habitat serves as an experimental laboratory for the development of hands-on activities and experiences that enable students to become aware of the role of wetlands. The proposed activities also provide the necessary background for them to make informed decisions regarding the future of this critical habitat.

Materials produced from this project include a generic curriculum development framework and instructions for the development of an engineered environment laboratory appropriate equally to other environments such as deserts and grasslands. Materials are designed by teachers in cooperation with the University of Delaware Instructional Technology Center.

Applications/Reforms in Secondary Education (ARISE)

Developer:
Solomon Garfunkel
Consortium for Mathematics and Its Applications (COMAP)
57 Bedford Street, Suite 210
Lexington, MA 02173
(617) 862-7878

Publisher/Distributor:
Please Contact Developer

Date Available: 1998 est

This project produces a three year secondary school mathematics curriculum. This curriculum consists of a 9-11 core which is application and modeling based. Materials incorporate computer and calculator experiences, a video applications library, appropriate assessment instruments as well as teacher manuals.

The materials are developed by the project staff, by a 30 member writing team including many high school teachers, and with assistance from the Educational Film Center, Rutgers University, the University of Wisconsin at Madison, and the Freudenthal Institute of the Netherlands.

Development of an Effective Decision-Skills Curriculum for Secondary School Students

Developer:
Robin Gregory
Donald MacGregor
Decision Science Research Institute
1201 Oak Street
Eugene, OR 97401
(503) 485-2400

Publisher/Distributor:
Please Contact Developer

Date Available: 1996 est

Improvement of the decision-making skills of secondary school students is an important component of the education reform movement. It is also a component in the education of workers for a competitive workforce. The materials strive to integrate decision skills with subject-based material. Students assume the role of active decision makers faced with problems confronting scientists. They learn how to interpret conflicting outcomes, to understand sources of uncertainty, to know when to go ahead despite a lack of information and when it is necessary to seek out additional information, and to distinguish personal from professional values and know how best to work with a team of colleagues possessing diverse skills. The project is undertaken with teachers in Eugene, Oregon, and other locations. Results to date indicate that students and teachers find the materials engaging and that learning science becomes more relevant.

The materials include discipline-specific modules, which link decision-making skills and which serve as an introduction to both the science and the decision-making, and a decision-skills handbook and video for teachers to see how to augment traditional science teaching.

Priming the Pump: Connected Geometry

Developer:
Albert Cuoco
Education Development Center (EDC), Inc.
55 Chapel Street
Newton, MA 02101
(617) 969-7100

Publisher/Distributor:
Janson Publications
450 Washington St., Suite 107
Dedham MA 02026
(800) 322-6284

Date Available: 1996 est

This project develops a set of curriculum materials and accompanying teacher-support materials that use geometry to bring a culture of mathematical exploration into the classroom and to interconnect students' experiences with various parts of mathematics. The materials, which rely heavily on existing geometry software and hands-on activities, include:

(1) a library of student activities designed so they can be used to form coherent units addressing specific content and themes;

(2) a Curriculum Map Maker designed to help teachers select activities and sequences of related activities, ranging from extensions of existing geometry courses to completely new courses; and

(3) a Self-Guided In-Service Package to help teachers learn to make effective use of the toolkit and to explore the new models of teaching embodied in the activities.

The activities are designed to foster students' development of mathematical ways of reasoning, analyzing and communicating, to link geometry to science, technology, art and other areas of students' experience, and to link geometry to important ideas in other areas of mathematics including algebra, analysis, number theory, and linear algebra.

High School Mathematics Courseware: Utilizing Real-World Problem-Solving to Teach Mathematics

Developer:
Thomas DeRose
Envision Interactive
504 Briar Road
Bellingham, WA 98225
(360) 676-7145

Publisher/Distributor:
Please Contact Developer

Date Available: 1997 est

The preparation that students receive in kindergarten through grade 12 and college is no longer adequate to sustain our nation's superiority in mathematics, science, and technology. A major educational reform is essential. The National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards provide excellent direction for changes in mathematics education and have inspired the development of this real-world problem-solving high school mathematics courseware. With this courseware, teachers can base their instruction on real-world problems to be solved using mathematics and provide their students with the power of computing technology to do so. The courseware consists of (1) a set of 60 simulated real-world problems that require practical solutions; (2) a set of 15 mathematical, measurement, and data-collection computing utilities; and (3) a teacher guide. Students are invited to explore problems, implement problem-solving strategies, apply the appropriate mathematical concepts, select and apply the computer utilities they think are appropriate, and determine whether or not the problems have been adequately solved. This courseware is available in CD-ROM-based multimedia as well as videotape and stand-alone computer software.

West Hawaii Explorations Academy: A Center for Integrative Secondary Curriculum Development

Developer:
Bill Woerner
Konawaena High School
P.O. Box 689
Kealakekua, HI 96750
(808) 323-3808

Publisher/Distributor:
None

Date Available: 1999 est

This project establishes a secondary educational facility which differs fundamentally from traditional classroom education. The West Hawaii Explorations Academy is an operational project and work experience laboratory for secondary students, and serves as a Center for integrative curriculum development and teacher training. The project is headquartered at the Natural Energy Laboratory of Hawaii, a state funded incubation facility for scientific research and commercial operations in aquaculture and energy development.

Approximately one hundred thirty three 10th through 12th grade heterogeneously selected students, including high-risk students, work and study full time throughout the school year. Students team with peers, staff, University of Hawaii faculty and students, graduate students, mentors, community members, and employers. Rather than attend classes, students receive credit for all of their core courses by managing and staffing a wide variety of projects. These include aquaculture and cold water agriculture research and production, alternatively-fueled vehicle research, environmental projects, aquarium site development, desalination, alternative energy development, sustainable research, and marine environments. While engaged in project work, they take modules in Records / Business / Finance/Media /Publications, Research Support, Facilities, Leadership and Reading/Writing.

The project's vision is to form a partnership with a research laboratory, a university and the community to develop a new model for education with the following goals:

a) enhance the prospect that students, including high risk youth, go to college or be employed;

b) encourage inservice teachers to adopt an integrative teaching style;

c) develop pre-service teachers who can implement an integrative program and modify the curriculum for high risk students;

d) increase the science, math and engineering expertise available to students;

e) serve as a national model program in expanding education beyond the walls of the classroom and attract community and university resources; and

f) prepare and distribute a collection of exemplary materials with national scope which promote and facilitate integrative education at the secondary level.

An external evaluator carefully documents project activities and student outcomes so the results can be disseminated to the profession.

Manufacturing Technology Learning Modules: Integrating Mathematics and Technology Education Curriculum

Developer:
Donald Esterling
Microcompatibles, Inc.
301 Prelude Drive
Silver Spring, MD 20901
(301) 593-3244

Publisher/Distributor:
Please Contact Developer

Date Available: 1996 est

This project develops materials that are used with existing computer-assisted design software, developed by Microcompatibles under a National Science Foundation Small Business Innovation Research grant. The materials are designed to motivate the study of mathematics in a technological context. The software creates a block on the screen; the block can be cut and drilled to make a part by using easy-to-learn commands. The student sees the part being cut on the screen and can zoom in and measure different areas of the part. Once the instructions for cutting have been completed, they can be sent by network or modem to a shop in which the part is actually made and sent to the student. This helps students learn three-dimensional visualization and integrate technology and math curricula.

Materials World Modules

Developer:
Robert Chang
Northwestern University
Materials Research Center
2115 North Campus Drive, Annenberg Hall G01
Evanston, IL 60208
(708) 491-5706

Publisher/Distributor:
Please Contact Developer

Date Available: 1996 est

The "Materials World Modules" constitute a series of materials science and technology kits designed to supplement existing mathematics and science curricula in high schools. The modules close the gap between frontiers of research and science in classrooms, providing open-ended experiences for both students and teachers. Nine modules cover basic materials systems, materials and society, and materials conservation and the environment. The modules provide students with hands-on experiences in design, synthesis, and evaluation of materials. The concepts of mathematics and science are reinforced in the application of materials science and technology to product development and manufacturing. Each module includes a self-contained experimental kit, teacher and student manuals, a videotape showing how experiments are conducted—including safety instructions—and a software package for data analysis and further modeling of the experiment. The products are developed by professors in the Materials Research Center at Northwestern working with educators and high school science, mathematics, and technology teachers.

Technology for Science I

Developer:
David Crismond
TERC
2067 Massachusetts Avenue
Cambridge, MA 02140
(617) 547-0430

Publisher/Distributor:
Please Contact Developer

Date Available: 1996 est.

A series of design challenges is developed to motivate high school students of all abilities to study science in the context of practical problem solving. Students research, design, construct, and evaluate solutions to practical problems that intrigue them. The challenges draw on information from across the range of traditional science topics. Solutions arise from group discussion and information analysis. These materials augment and consolidate science learning and, more importantly, generate process and practical skills, which are transferable to other circumstances. Such practical skills include team work, information gathering and processing, evaluation, and application of knowledge to practical situations. Sample assessment strategies for working with groups of students of diverse abilities are developed. To help teachers and students find feasible solutions, a "Source Book" is produced. In addition, a teacher resource guide, suggesting sources of materials, giving technical advice, and linking the challenges to science topics, is provided.

Design and Technology for Science

Developer:
Jack Lochhead
TERC
2067 Massachusetts Avenue
Cambridge, MA 02140
(617) 547-0430

Publisher/Distributor:
Please Contact Developer

Date Available: 1998 est.

Building on the successful development of four challenge-enhanced, replacement science curriculum units for grade 9-12, the aim of this project is to create and publish 12 units that use design challenges while still emphasizing the learning of science concepts. Design and Technology for Science includes challenges that involve biology, physical science, physics, integrated sciences, and technology education topics. The curriculum focuses upon selective process skills: information-gathering, designing, and planning and conducting experiments. The units address national standards and teach integrated science-technology in a work-related context useful both in academic and vocational programs. The units can be used flexibly by teachers who are creating science and technology courses and by technology education teachers who want to experiment with open-ended, constructivist-based materials that emphasize the acquisition of science concepts. Optional low technology activities support the use of microcomputer-based laboratory equipment in the classroom as well as the use of graph-generating spreadsheets to collect and display data. Thus, students take on the role of scientists and engineers as they experience hypothesis generating-testing and design cycles in real-world settings, and engage in tasks that integrate a wide range of scientific and technology-oriented skills and concepts.

Professional LINKS Project

Developer:
Keith Finkral
Ronald Todd
Trenton State College
School of Technology
103 Armstrong Hall
Trenton, NJ 08650
(609) 771-3333

Publisher/Distributor:
TIES Magazine
Trenton State College
103 Armstrong Hall
Trenton NJ 08650
(609) 771-3333

Date Available: 1998 est.

Instructional materials that integrate mathematics, science, and technology education are greatly needed. This project produces several instructional packages for secondary school students; the packages are consistent with the standards from each of the disciplines. They are developed in a collaborative effort among teachers, subject specialists, and practitioners from science and industry.

Local and national support is available to help teachers and groups of teachers use the materials. The products include: the units, teacher guides for use of the materials, and support via electronic means. Themes to be engaged include: science and technology of sports, biotechnology, music, and fire-prevention and control systems.

Agriculture-Based Secondary Mathematics Project

Developer:
Jack Robertson
Michael Kallaher
Washington State University
Department of Mathematics
Pullman, WA 99164
(509) 335-3142

Publisher/Distributor:
Consortium for Mathematics and Its Applications (COMAP)
57 Bedford Street, Suite 210
Lexington MA 02173
(617) 862-7878

Date Available: 1996 est.

Classroom ready materials on agriculture related mathematics are developed by a team of authors consisting of eastern Washington secondary teachers, Washington State University professors, and non-academic members of the agriculture industry. The materials are designed to supplement existing secondary mathematics classes and include student work pages, computer exercises, cooperative learning projects and a video tape informing students of the important role of mathematics in agriculture. Some material is written to include parental involvement.

GETTING NSF INFORMATION AND PUBLICATIONS

The National Science Foundation (NSF) has several ways for the public to receive information and publications. Electronic or printed copies of the NSF telephone directory, abstracts of awards made since 1989, and many NSF publications are available as described below. To access information electronically, there is no cost to you except for possible phone and Internet access charges. Choose the method of access that matches your computer and network tools. For general information about Internet access and Internet tools, please contact your local computer support organization.

WORLD WIDE WEB: NSF HOME PAGE

The World Wide Web (WWW) system makes it possible to view text material as well as graphics, video, and sound. You will need special software (a "web browser") to access the NSF Home Page. The URL (Uniform Resource Locator) is ***http://www.nsf.gov/.***

INTERNET GOPHER

The Internet Gopher provides access to information on NSF's Science and Technology Information System (STIS) through a series of menus. To access the Gopher, you need Gopher client software; the NSF Gopher server is on port 70 of ***stis.nsf.gov***.

ANONYMOUS FTP (FILE TRANSFER PROGRAM)

Internet users who are familiar with FTP can easily transfer NSF documents to their local system for browsing and printing. The best way to access NSF information is to first look at the index (file name: **index.txt**). From the index, you can select the files you need. FTP instructions are:

- FTP to ***stis.nsf.gov***.
- Enter **anonymous** for the user name, and your e-mail address for the password.
- Retrieve the appropriate file (i.e., **filename.ext**).

E-MAIL (ELECTRONIC-MAIL)

To get documents via e-mail, send your request to the Internet address ***stisserve@nsf.gov***. The best way to find NSF information is to request the index. Your e-mail message should read: **get index.txt**. An index with file names will be sent to you. However if you know the file name of the document you want, your e-mail message should read: **get <filename.ext>**.

E-MAIL MAILING LISTS

NSF maintains several mailing lists to keep you automatically informed of new electronic publications. To get descriptions of the mail lists and instructions for subscribing, send your request to: ***stisserve@nsf.gov***. Your message should read: **get stisdirm.txt**.

ON-LINE STIS

NSF's Science and Technology Information System (STIS) is an electronic publications dissemination system available via the Internet (telnet to ***stis.nsf.gov***); you will need a VT100 emulator. The system features a full-text search and retrieval software (TOPIC) to help you locate the documents. Login as **public** and follow the instructions on the screen.

To get an electronic copy of the "STIS USERS GUIDE," NSF 94-10, send an e-mail request to: ***stisserve@nsf.gov***. Your message should read: **get NSF9410.txt**. For a printed copy of the "STIS USERS GUIDE," see instructions "How To Request Printed NSF Publications."

NON-INTERNET ACCESS VIA MODEM

If you do not have an Internet connection, you can use remote login to access NSF publications on NSF's on-line system, STIS. You need a VT100 terminal emulator on your computer and a modem.

- Dial **703-306-0212**,
- choose 1200, 2400, or 9600 baud,
- use settings 7-E-1, and
- login as **public** and follow the on-screen instructions.

NSF 95-64 (Replaces NSF 94-4)

HOW TO REQUEST PRINTED NSF PUBLICATIONS

You may request printed publications in the following ways:

- send e-mail request to: ***pubs@nsf.gov***
- fax request to: **703-644-4278**
- for phone request, call: **703-306-1130** or Telephonic Device for the Deaf (TDD **703-306-0090**)
- send written request to:

  NSF Forms and Publications Unit
  4201 Wilson Boulevard
  Room P-15
  Arlington, VA 22230

When making a request, please include the following information:

- NSF publication number;
- number of copies; and
- your complete mailing address.

QUESTIONS ABOUT NSF PUBLICATIONS, PROGRAMS, ETC.

Contact the NSF Information Center if you have questions about publications, including publication availability, titles, and numbers. The NSF Information Center maintains a supply of many NSF publications for public use. You may:

- visit the NSF Information Center, located on the second floor at 4201 Wilson Blvd., Arlington, Virginia.; or
- call the NSF Information Center at **703-306-1234**; or **703-306-0090** for TDD; or
- send e-mail message to ***info@nsf.gov***.

QUESTIONS ABOUT THE ELECTRONIC SYSTEM

Send specific, system-related questions about NSF electronic publication services that are not answered in this flyer, to ***webmaster@nsf.gov*** or call **703-306-0214** (voice mail).

NATIONAL SCIENCE FOUNDATION
ARLINGTON, VA 22230

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL ☐, OR IF CHANGE OF ADDRESS IS NEEDED ☐, INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

U.S OFFICIAL MAIL
PENALTY FOR PRIVATE USE $300
$1.01

00145173 ERIC
ERIC FACILITY
1301 PICCARD DRIVE
SUITE 300
ROCKVILLE MD 20850-4305

PT 22,25,42,44
KW 0502031
0502023
0502020
0502033
0504000
0506000

NSF 96-61